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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/099,800	03/13/2002	Kent Kuohua Chang	JCLA8579	3086

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05/23/2003

EXAMINER

DOAN, THERESA T

ART UNIT PAPER NUMBER

2814

DATE MAILED: 05/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/099,800

Applicant(s)

CHANG, KENT KUOHUA

Examiner

Theresa T Doan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3 and 9-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Yu (U.S. 6,521,502).

Regarding claim 1, Yu teaches in figures 1-6 a method to suppress a short channel effect of a semiconductor device, comprising:

forming a gate structure 14 on a substrate 12;

forming a source/drain extension region (20,22) and a source/drain region (17,19) in the substrate beside the gate structure;

performing a pocket ion implantation process to form a pocket doped region 24 under the source/drain extension region (20,22), (see figure 1, column 4, lines 26-33);
and

performing a rapid thermal process to anneal the source/drain extension region, the source/drain region and the pocket doped region concurrently (see figure 1, column 4, lines 58-67 and column 5, lines 1-15).

Regarding claims 2-3, Yu teaches in figures 1-6 the source/drain extension region (40,42) and the source/drain region (54,56) are implanted with an N-type dopant wherein the N-type dopant is selected from the group consisting of arsenic ions (column 5, lines 54-62 and column 6, lines 28-35).

Regarding claims 9-10, Yu teaches in figures 1-6, a dosage of the pocket doped implantation process is about $1 \times 10^{13} \sim 1 \times 10^{14} \text{ cm}^{-2}$ and the pocket doped implantation tilt angle is about 10-30 degrees (column 6, lines 8-19).

3. Claims 1-3 and 6-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Park et al. (U.S. 6,268,640).

Regarding claim 1, Park et al. teach in figure 6 a method to suppress a short channel effect of a semiconductor device, comprising:

forming a gate structure 4 on a substrate 1;

forming a source/drain extension region 6 and a source/drain region 10 in the substrate beside the gate structure;

performing a pocket ion implantation process to form a pocket doped region 7 under the source/drain extension region 6 (see figure 6, column 5, lines 7-10); and

performing a rapid thermal process to anneal the source/drain extension region, the source/drain region and the pocket doped region concurrently (column 5, lines 30-32).

Regarding claims 2-3, Park et al. teach in figure 6 the source/drain extension region 6 and the source/drain region 10 are implanted with an N-type dopant wherein the N-type dopant is selected from the group consisting of arsenic ions (column 5, lines 7-9).

Regarding claims 6-7, Park et al. teach in figure 6 the pocket doped region 7 is doped with a p-type dopant wherein the p-type dopant includes indium ions (column 5, lines 8-10).

4. Claims 1, 6-7 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang et al. (U.S. 6,380,021).

Regarding claim 1, Wang et al. teach in figures 1-6 a method to suppress a short channel effect of a semiconductor device, comprising:

forming a gate structure 16 on a substrate 10;

forming a source/drain extension region 26 and a source/drain region 46 in the substrate beside the gate structure;

performing a pocket ion implantation process to form a pocket doped region 24 under the source/drain extension region 26 (see figure 6, column 2, lines 54-58); and

performing a rapid thermal process to anneal the source/drain extension region, the source/drain region and the pocket doped region concurrently (see figure 6, column 8, lines 5-8).

Regarding claims 6-7, Wang et al. teach in figure 6 the pocket doped region 24 is doped with a p-type dopant wherein the p-type dopant includes indium ions (column 2, line 58).

Regarding claim 11, Wang et al. teach in figure 6 the rapid thermal process is conducted under a temperature of about 900-1050 degrees Celsius for about 0-30 seconds (column 8, lines 5-8).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-3, 6-7, 11-13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art (APA) in view of Wang et al. (U.S. 6,380,021).

Regarding claims 1-3, 6-7, 12-13 and 16, APA in figures 1A-1E teaches a method to suppress a short channel effect of a semiconductor device, comprising:

forming a gate structure 106 on a substrate 100;

performing a first ion implantation process 107 to form a source/drain extension region 108 in the substrate using the gate structure 106 as an implantation mask;

forming a spacer 110 on a sidewall of the gate structure;

performing a second ion implantation process 111 to form a source/drain region 112 using the spacer 110 as an implantation mask (see figure 1B);

performing a pocket doped implantation process 114 to form a pocket-doped region 116 under the source/drain extension region 108 after the formation of the source/drain extension region and the source/drain region (see figure 1D).

APA does not teach a step of performing a rapid thermal process after the formation of the pocket-doped region to anneal the source/drain extension region, the source/drain region and the pocket-doped region. However, Wang et al. teach performing a rapid thermal process after the formation of anneal the P-type pocket-doped region 24 using indium (column 2, line 58), the N-type of source/drain extension region 26 and the source/drain region 46 using arsenic ions (see figure 6, column 3, lines 10-40 and column 8, lines 5-8) for reducing transient enhanced diffusion in order to achieve shallow junctions (column 1, lines 23-24). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply performing a rapid thermal process after the formation of the pocket-doped region to anneal the source/drain extension region, the source/drain region and the pocket-doped region in APA structure as taught by Wang et al.'s method in order to achieve shallow junctions.

Regarding claims 11 and 20, APA does not teach the rapid thermal process is conducted under a temperature of about 900 degrees Celsius for about 10 seconds. However, Wang et al. teach the rapid thermal process of the wafer is about 900-1050

degrees Celsius for about 0-30 seconds (column 8, lines 5-8) in order to achieve high activation. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply the method of rapid thermal process in APA's device as taught by Wang et al. in order to achieve high activation.

7. Claims 4-5 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art (APA) in view of Wang et al. (U.S. 6,380,021) as applied to claims 2 and 12 above, and further in view of Park et al. (U.S. 6,268,640).

APA and Wang et al. do not explicitly state that implantation energy for the first ion implantation process is about 10 KeV and wherein a dosage of the first ion implantation process is about $3 \times 10^{14} \text{ cm}^{-2}$. However, Park et al. teach in figure 6 an implantation energy for forming the source/drain extension region 6 is less than about 15 KeV and wherein a dosage that is implanted for the source/drain extension region 6 is at least $2 \times 10^{14} \text{ cm}^{-2}$ (column 5, lines 11-15) in order to operate the device in its intended use. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply the method teaching of Park in APA and Wang's device in order to operate the device in its intended use; since it has been held where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties.

Titanium Metals Corporation of America v. Banner, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). (See 09/207,059).

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8. Claims 8-10 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art (APA) in view of Wang et al. (U.S. 6,380,021) as applied to claims 7 and 16 above, and further in view of Yu (U.S. 6,521,502).

APA and Wang et al. do not explicitly state that implantation energy for the pocket doped implantation process is about 60 KeV wherein a dosage of the pocket doped implantation process is about $1 \times 10^{13} \text{ cm}^{-2}$ and the pocket doped implantation tilt angle is about 30 degrees.

Yu teaches in figures 1-6 an implantation energy for the pocket doped implantation process is about 5-50 KeV wherein a dosage of the pocket doped implantation process is about $1 \times 10^{13} \sim 1 \times 10^{14} \text{ cm}^{-2}$ (column 6, lines 10-12) and the pocket doped implantation tilt angle is about 10-30 degrees (column 6, lines 15-19) in order to operate the device in its intended use. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply the method teaching of Yu in APA and Wang's device in order to operate the device in its intended use; since it has been held where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corporation of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). (See 09/207,059).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T Doan whose telephone number is (703) 305-

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2366. The examiner can normally be reached on Monday to Thursday from 8:00AM - 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, WAEL FAHMY can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TD
May 16, 2003


PHAT X. CAO
PRIMARY EXAMINER